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Studies on the Eggs of Some Reduviidæ (Heteroptera).

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DURING the past few summers the writer has been working on the biology of various Heteroptera, and has more than once been struck with the unusual appearance of the eggs of the Reduviidæ. Not only are the individual eggs of some of the species very much decorated, but the ornamentation is different in the egg of each species, and is in fact characteristic for the species. This paper presents a general discussion of the eggs in this family, followed by descriptions and notes on the eggs of each species studied.

The family Reduviidæ is one to which no uniform habitat can be assigned, and we find the eggs in as wide a variety of situations as we find the insects themselves. Thus some tree-inhabiting species attach their eggs to the trunks and larger branches of trees. Others show a preference for the twigs, and still others attach their eggs to the leaves themselves. Those species which live on the lower foliage of open, sunny fields usually attach their eggs to the stems and leaves of grasses and weeds. Several ground-inhabiting species lay their eggs partly buried in the soil underneath protected rocks, and still others attach their eggs to the rocks themselves, usually on the lower side. Thus, the only generalization possible is that the eggs are usually found in the same situations in which we find the adults, however varied these may be.

The time of year when the eggs are laid also varies a good deal for the different species in the family. At least one species we know of, *Arilus cristatus* (Linnæus), lays its eggs in the fall and spends the winter in the egg stage. A good many reduviids spend the winter as adults and lay their eggs in spring and early summer, and a third group spend the winter as nymphs, become adults in the spring and summer, and lay their eggs then.

In the grouping and attachment of the eggs we find no more uniformity than before. *Reduvius personatus* (Linnæus) deposits its eggs singly in out-of-the-way places, with no sign of definite arrangement or attachment. *Melanolestes picipes* (Herrich-Schäffer) also lays its eggs singly, but in this case the bases are inserted into the ground for support. *Pselliopus cinctus* (Fabricius) is another species which lays its eggs one at a time, but each egg is attached to its supporting surface by a cement. Other species lay their eggs in groups of various numbers, from three to fourteen in the case of *Sinea spinipes* (Herrich-Shäffer), up to over a hundred and fifty in the case of the *Arilus cristatus* (Linnæus). The grouping of the eggs in masses, and the amount of cement used to attach and protect the eggs also varies. This lack of uniformity does not permit of generalizations, but demands separate descriptions for each species.

The more general features of the structure of the egg are uniform throughout the family. The egg is usually cylindrical or elongate-ovate, and in every species in which the egg has been studied there is, at one end, a definite cap which is pushed off in the hatching process. This cap is plain, or it may be ornamented, as is more often the case, in a variety of ways. The rim of the egg, surrounding the cap, may also be ornamented by an extension of the chorion. It is the ornamentation of the cap, and the extension of the chorion around the cap, that give the eggs in this family their unique appearance.

The eggs of twenty species and one variety of our United States fauna are discussed. These are distributed over six subfamilies and fourteen genera. While this is only a very small representation of the total number of species found in the United States, yet a surprising variety in form is found to exist. An attempt was made to determine whether members of the same subfamily, and of the same genus, show the similarity that one would expect, and while the number of species available was not as large as could be desired for this study, yet the indications are that there is subfamily and generic resemblance in the eggs.

SUBFAMILY PLOIARIINÆ.

The eggs of three species of this subfamily have been studied at first hand, and a description of those of a fourth species is found in the literature.

Empicoris rubromaculatus (Blackburn).

I have received recently from Mr. McAtee, of the United States National Museum, some specimens of the eggs of this species. Unfortunately they are not in as good condition as one would wish, being somewhat shrunken and distorted, and consequently do not lend themselves well to exact description. Certain things concerning them may be mentioned, however. The eggs are about six-tenths of a millimeter in length, and about one-half as wide. The color is dark brown; the shape cylindrical. At one end there is a definite, circular cap. In their present condition they show no evidences of ornamentation, although inasmuch as the eggs of the other members of this subfamily are ornamented, it seems reasonable to question, at least, whether or not these have lost their ornamentation.

Empicoris errabundus (Say).

The writer has not been able to obtain the eggs of this species, but a description of them prepared by Provancher[13] is available. A free translation of this description is given for the sake of making this work as complete as possible:

"This insect, taken at Trois-Rivieres and transported alive in a small box, deposited its eggs during the journey. The eggs, ten in number, were kidney-shaped, hollowed out on their inner side and bearing four or five white lines on the back. One of the extremities is terminated by a little cap preceded by a slight constriction, and bearing at the end a projection in the shape of a coronet. They are attached to the pedicel, not by an extremity, but by the dorsal surface; that is, the pedicel is prolonged on the pasteboard and adheres there in the form of a very thin line, bearing each egg attached on its middle by its dorsal surface. From the exterior appearance they might easily be mistaken for the seeds of umbelliferous plants or the anthers of certain flowers. It was only after having submitted them to the microscope that we were able to convince ourselves that they were animal, and not plant productions."

From this description it can be seen, at least, that the eggs of this species are like those of the two following species, for which figures are given, in that they are ornamented both on the body and on the cap, and are attached along one of the long surfaces of the egg rather than at the base.

Emesaya brevipennis (Say).

(Pl. X, fig. 10.)

The eggs of this species have been studied, figured and described by several observers. The writer has abundant material of the eggs of this species collected in Kansas. The following description of the eggs is given by McAtee and Malloch:[11]

"The eggs of this species are about 2 millimeters in length, long-elliptical in outline, the opercle with a large central truncately conical tubercle, the periphery of which is more or less eroded at the base; the main body of the egg is black in ground color, somewhat compressed and with longitudinal rows of membranous, saw-tooth-shaped exfoliations, the bases of which are almost continuous; these lines of projections are arranged more or less in concentric ellipses on the flat sides of the egg."

These eggs are laid singly, attached to the bark of trees, particularly evergreen (Weed),[7] or to rafters (Howes).[8] The writer has collected eggs which were attached to the rafters of a shed, and has also found them attached to a spider's thread. Each egg is attached along its long surface, near the base. The egg is inclined and forms an angle with the surface upon which it rests.

Metapterus fraternus (Say).

(Pl. X, fig. 11.)

The eggs of this species have been figured by McAtee and Malloch,[11] but no description accompanies their figure. The following description has been prepared by the writer: Length, 1.4 mm.; width of top, .3 mm. Shape, rather elongate, cylindrical, with axis of cylinder slightly curved; base rounded, apex truncate, surmounted by a cap with central conelike projection; longitudinal, flangelike ridges on body of egg for whole length, ridges united in pairs at base of egg, extended a little beyond apex of body of egg; cap with peripheral, reticulated area, and central conelike structure, this formed of projections from reticulated area. Color of body of egg dark brown and shining, of flangelike longitudinal ridges whitish, of reticulated area and cone of cap greyish-white.

These eggs, as in the preceding species, are laid singly and attached in the same manner. In the laboratory they were attached to bits of roots, and to the sides of the rearing dishes.

The similarity between the eggs of the last two species mentioned is quite evident. They are both comparatively elongate and slender, both provided with longitudinal ridges, and both fitted with a conical cap. Eggs of the members of no other subfamily resemble them except in very general features.

SUBFAMILY STENOPODINÆ.

The eggs of only one species of this subfamily are available for study. No previous reference to the eggs of this species, nor to the eggs of any other United States species of this subfamily have been found.

Oncocephalus apiculatus Reuter.

(Pl. X, fig. 4.)

The eggs described here were obtained this past summer from a wingless female which answers to Reuter's[14] description of the female of this species.

Description of egg: Length, 1.4 mm.; greatest width, 1 mm.; diameter at cap, .7 mm. Color, uniform dull white, surface reticulated. Body of egg nearly spherical in shape, slightly longer than wide; base smoothly and evenly rounded, apex truncate and with a distinct cap; upper extremity narrowed to a distinct collar, irregular fringe of extension of chorion above collar; cap within fringe, circular in outline, somewhat concave; periphery of cap with a regular and closely spaced circle of erect appendages of uniform length, produced rimlike beyond irregular fringe of extended chorion; convex disk of cap with clothing of rather closely spaced hair-like appendages.

This egg is quite different from that of any other species studied. Whether it is typical for the subfamily or not will be seen when eggs of other species of the subfamily are discovered.

The eggs of this species are inserted into the ground, with only the upper end visible, as is the case in the subfamily Piratinæ.

SUBFAMILY REDUVIINÆ.

The eggs of only one species of this subfamily, *Reduvius personatus* (Linnæus), have been obtained for study. However, figures and descriptions of two other species from the United States are available for comparison. These are *Triatoma sanguisuga* (Le Contte) and *Triatoma protracta* (Uhler). The eggs of these three species are similar and differ from the eggs in other subfamilies in lacking the usual ornamentation of the top of the egg and of the cap. In fact, they are the simplest of the reduviid eggs studied.

Reduvius personatus (Linnæus).

(Pl. IX, fig. 1.)

This is the "Masked bedbug hunter," a European species now well established in this country, and well known as an occasionally troublesome inhabitant of houses.

The following description of the egg is taken from E. A. Butler,[3] who in turn quotes from Leuckhart:

"The eggs of *Reduvius personatus* recall by their form those of the Pentatamidæ. They are oval and obese, fully 1 mm. long, narrowed toward the base and furnished at the flatter end with a rather flat lid which carries a groove. The brownish yellow chorion is decidedly hard. The outer surface is quite smooth and shining, the inner, on the contrary, is of finely granulated appearance. No further structure can be seen except here and there a minute canal leading to the under surface of the chorion, and undoubtedly intended to bring air into close contact with the yolk and embryo. The outer margin of the groove round the lid is lengthened into a thin, projecting, rimlike lamella, on the inner wall of which there are a number of vertical prominences. These are the micropyles, and their number may amount to about eighty. In each of these micropyles can be distinguished two parts, one outer and cupshaped, the other inner and canal-shaped. The former is attached all along to the inner surface of the lamella; it begins with a transverse opening close beneath the upper margin of the rim, and gradually narrows till it reaches the bottom of the groove. The free, cupshaped part is continued into a canal which penetrates the chorion. Out of the lower end of the cup there arises a fine passage, the above-mentioned under segment of the micropyle, which runs down for a short space in the substance of the chorion, and then after a short bend opens on to the inner surface."

I obtained the eggs of this species by isolating adult females which were found here and there in houses. Evidently these females had mated previously, for in every case the eggs obtained were fertile.

Triatoma sanguisuga (Le Conte).

(Pl. IX, fig. 2.)

This species, because of its tendency to feed on human blood, is known as the "Blood-sucking cone-nose," or "Big bedbug." Heidemann,[5] in his work on the eggs of the Heteroptera, gives the following descriptive notes concerning the eggs of this species:

"Egg, 1 mm. long; ovate, chorion somewhat flattened near the lower end; the inner side of the extension of the rim shows the chorial processes plainly; outer surface very fine granulate, pearly white."

Miss Kimball,[9] in her paper on the life history and habits of this species, gives the following description of the egg:

"The egg, which is about the size of a mustard seed, and of a yellow color, is peculiar in its shape, resembling that of a bottle with a thickened rim

around the top, giving this portion the appearance of a stopper, especially after the egg hatches, as the insect pushes out this tiny, saucerlike top, which falls to the ground. Though yellowish when first laid, the egg soon changes in color to pink, and then to red, as the insect develops within, until just before hatching, when the segments of the body can be seen through the transparent shell."

Triatoma protracta (Uhler).

I find a brief note concerning the eggs of this species given by Herms.[6] This is quoted:

"*Triatoma protracta* (Uhl.) deposits large whitish eggs in small numbers (three to six) at a laying under laboratory conditions in almost any sort of vial or container in which the female may happen to be imprisoned. The eggs are deposited during midsummer and late summer at least until early September in Berkeley (California) indoors."

Herms' photograph of the egg of this species shows that in essential structure it is similar to that of the preceding species.

The significant thing in the structure of the eggs of the species of *Triatoma* is that the cap itself is not ornamented, and that the chorion in the region surrounding the cap is not ornamented. In this respect the eggs resemble those of *Reduvius personatus* (Linnæus), a member of the same subfamily. However, the eggs in this subfamily are the only ones studied where the structure is so simple.

SUBFAMILY PIRATINÆ.

The eggs of two species of this subfamily have been obtained for study, and it is interesting to note that they are similar both in structure and in place and manner of deposition, while at the same time they differ in these respects from the eggs in the other subfamilies studied. The two species in which the eggs have been studied are *Melanolestes picipes* (Herrich-Schäffer) and *Rasahus biguttatus* (Say). No previous references to the eggs of these species nor to the eggs of any other United States species of this subfamily have been found.

Melanolestes picipes (Herrich-Schäffer).

(Pl. IX, figs. 3 and 4.)

This is a very common, black reduviid taken commonly on the ground under rocks and logs, and occasionally coming to lights at night. Its ability to inflict a poisonous bite, and its willingness to do this in defense, has given it, along with several other reduviids of similar habits, the name, "Kissing bug."

Description of egg: Length to extension of chorion, 2.5 mm.;

greatest width, 1.3 mm. to 1.5 mm.; diameter of extension of chorion, 2.2 mm. to 2.5 mm. Color, entirely dull white at first, later darker with progression of incubation, appendages and segmentation visible. Shape, elongate oval; distinct collar at upper end, beyond this chorion extended in a series of flat, elongate scales, these arranged radially around cap, each scale narrowed slightly towards tip, tip rounded; scales toothed along margins, forty to fifty radiating scales present. Cap more or less sunken in middle, radiating scales at periphery, these produced for a short distance over the scales of the extension of the chorion, closely pressed to these and attached, one scale of cap to each scale of extension of chorion.

The eggs of this species were obtained by collecting adults in their natural habitat under rocks early in the spring, and confining them in suitable cages with insects supplied as food. Eggs were also collected in the field. Both in the laboratory and in the field the eggs were placed in the ground, the entire lower portion of the egg being buried, with only the white, starlike top visible. They are always laid under some protecting rock or log.

Eggs were also obtained from the variety *abdominalis* (Herrich-Schäffer) of this species. These eggs were similar to those of the typical individuals of the species.

Rasahus biguttatus (Say).

(Pl. IX, figs. 5 and 6.)

This insect, known commonly as the "Two-spotted corsair," is abundant enough to have caused some comment in economic literature because of its bite, which, the writer can attest, is very painful.

Description of egg: Length to extension of chorion, 2.5 mm.; greatest width, 1.3 mm.; length of extension of chorion, 0.6 mm. Color, dead white at first, darker later, finally with red eyes, dark legs, and red and white striped abdomen of unhatched insect visible. Shape, elongate-ovate, ornamented in the region of cap; collar at top of egg, beyond collar chorion extended in a series of curved scales, about forty in number, scales with no teeth along margins; central area of cap with a very distinct, erect spine, periphery of cap with long, slender scales; scales of cap produced over scales of extension of chorion, attached to them, equal in number to the scales of the extension of the chorion.

This egg is quite similar to that of the closely related *Melanolestes picipes* (Herrich-Schäffer). The two eggs differ: (1) in that the scales forming the extension of the chorion are longer, more nearly horizontal, and bear small teeth along their lateral margins in

Melanolestes picipes (Herrich-Schäffer), whereas they are shorter, more nearly erect, and bear no teeth in *Rasahus biguttatus* (Say); (2) in that the radiating scales of the cap are broader and shorter, not extending over more than one-third the length of the chorion scales in *Melanolestes picipes* (Herrich-Schäffer), and are longer and narrower, extending almost or quite to the tip in *Rasahus biguttatus* (Say); and (3) in the presence of a central spine in *Rasahus biguttatus* (Say), which is lacking in *Melanolestes picipes* (Herrich-Schäffer).

The eggs of this species are placed in the ground under the protecting rocks which shield the adults. Sometimes the eggs are entirely buried, sometimes standing erect but buried with the exception of the extending scales of the chorion, and sometimes lying flat, partially buried.

SUBFAMILY APIOMERINÆ.

The eggs of only one species of this subfamily, *Apiomerus spissipes* (Say), are represented in my collection, though a description and figure of the egg of another species, *Apiomerus crassipes* (Fabricius), are available for comparison. The eggs of these two species of the same genus are quite similar, and at the same time different from the eggs in the other subfamilies studied.

Apiomerus spissipes (Say).

(Pl. X, figs. 9 and 12.)

This is a broad, stout, hairy insect, found as an adult on the stems and leaves of tall weeds and other plants, and as a nymph, at least by the writer, under rocks. Morgan [12] studied the life history of this insect as a possibly important natural enemy of the cotton boll weevil, but concluded that the insect was economically insignificant in this respect.

Morgan [12] gives the following description of the egg:

"The egg is cylindrical, finely punctured, and varies in color from a bright yellow when first deposited to a light brown just before hatching. The collar is shining white. The dimensions of the egg are as follows: Width at narrowest part—just below collar—0.5 mm.; greatest width, 0.64 mm.; length below collar, 1.51 mm.; length of collar, 0.26 mm.; total length, 1.77 mm. The width of the collar varies from slightly less than the greatest width of the egg to slightly more."

I wish to add to this description by saying that the collar referred to above is formed as the extension of the chorion by longitudinal scales connecting with each other so as to form the membranelike

collar. The cap of the egg is sunken in the middle, somewhat elevated around the outer rim, and is fringed with conspicuous white scales.

Morgan gives the following additional notes concerning the eggs:

"The eggs are laid in masses, though as few as 10 were laid in one instance and 23 in another. Individual records are as follows: 37, 41, 49, 54, and 64. The usual place for oviposition is the underside of a leaf, near the top of the plant. Egg masses have been collected in this position from *Ambrosia* sp. and *Helianthus* sp. The eggs are placed so close to each other, side by side, that in the center of the mass, instead of being cylindrical, they are usually more or less hexagonal."

It is worth mentioning that the writer was unable to find the eggs of this species on the leaves of plants in Kansas, but did find several egg masses attached to rocks on the ground. In one case an egg mass was attached to the upper surface of a rock which was covered by a superimposed rock, and in another case the egg mass was found on the under side of a rock which rested on the surface of the ground.

Apiomerus crassipes (Fabricius).

As mentioned above, the writer has not been able to find the eggs of this species, but has found a figure and descriptions of them which are valuable. The species is very closely related to the preceding. Heidemann[5] gives the following description of the eggs of this species:

"Egg, 1.8 mm., oval-elongate; color, dark brown; the extension of the chorion at upper egg-pole composed of longitudinal fine scales connecting with each other, yellowish around the rim and white at the edge; the cap rather low, crowned with white scales, of which those on the inside circumference are brown."

Uhler,[15] in speaking of this species, says that it lays its eggs on the twigs and bark of the common pine trees, and that these hatch during the early summer.

It is impossible for the writer, having at hand only descriptions and figures of the eggs of this species, to pick out any essential difference between it and the preceding species. It is probable that if the two eggs were compared side by side some difference would be apparent. It should be remembered, however, that the two species are very closely related indeed, difficult of separation even as adults.

It is regrettable that there is no more material of this subfamily available, but with the limited material at hand, it is evident that the eggs of this subfamily are different from those in other subfamilies, and represent, in fact, a distinct type.

SUBFAMILY HARPACTORINÆ.

The eggs of eight species of this subfamily, distributed among five genera, have been studied. These species are *Zelus exsanguis* (Stal) and *Z. socius* (Uhler), *Pselliopus cinctus* (Fabricius) and *P. barberi* Davis, *Arilus cristatus* (Linnæus), *Acholla multispinosa* (DeGeer), *Sinea diadema* (Fabricius), and *S. spinipes* (Herrich-Schäffer). In every case where more than one species of a genus has been studied, generic resemblance is apparent. From a study of the figures presented it is at once apparent that there is no great degree of uniformity in the eggs of the subfamily as a whole. While it is true that the eggs *Pselliopus* and *Zelus* resemble each other, as do also the eggs of *Arilus*, *Acholla* and *Sinea*, yet the eggs of these two groups do not resemble each other any more closely than they do those of the Apiomerinæ. To be sure, this is a large and somewhat heterogeneous subfamily, which fact probably accounts for the lack of uniformity in the eggs.

Zelus exsanguis (Stal).

(Pl. X, figs. 5, 6 and 7.)

From the number of references to this insect, either under this name, or its synonym, *Diplodus luridus*, it must be very common. Indeed, the writer has found it to be very common in woods in Kansas. It is a very slender, long-bodied, green species, with very long, slender legs. The eggs have been described by Kirkland,[10] but this description is not available. Heidemann[5] gives the following brief notes:

> "The sticky secretion the insect uses for protecting its eggs covers sometimes also the cap, leaving only in the center a small opening; chorial processes close together, club-shaped."

The writer wishes to add to this description by giving the dimensions of the egg: Length, 2 mm.; greatest width, 0.7 mm.; length of extension of chorion, 0.3 mm.

The eggs of this species were found very commonly in the field, and also were easily obtained in the laboratory by isolating adult females. The eggs are laid in very compact, five- or six-sided masses, each egg standing on end, and pressed so tightly by the surrounding eggs as to have a definite hexagonal shape. The eggs are embedded in, and, in fact, almost entirely surrounded by a cement, this species being the most generous in this respect of all those studied. The egg mass is brown when viewed from the side and white when viewed from the top. Each egg mass contains in the neighborhood of fifty eggs.

Zelus socius (Uhler).

(Pl. X, fig. 8.)

The eggs of this species, a darker form than the preceding species, have recently been obtained, and should be included in this discussion. They are very similar indeed to those of the preceding species, but may be separated from them by size and by the nature of the egg mass.

Dimensions of eggs: Length, 1.7 mm.; greatest width, .5 mm.; length of extension of chorion, .2 mm.

These eggs show very clearly the relationship which exists between this species and *Zelus exsanguis* (Stal). While the individual eggs of the two species are very similar, the egg masses themselves are different. While *Zelus exsanguis* (Stal) deposits its eggs in a very compact five- or six-sided mass, *Zelus socius* Uhler produces an elongate mass, of the width of not more than three or four eggs. The material at hand does not permit an investigation into the nature of the cap. It is quite probable that other differences would be found here. A count of a single egg mass of *Zelus socius* Uhler shows it to contain twenty-three eggs.

Pselliopus cinctus (Fabricius).

(Pl. X, figs. 1, 2 and 3.)

This is a beautiful orange-yellow and black species, quite common on the leaves and twigs of trees and bushes, and occasionally found on lower plants, as Chittenden[4] has recorded it as one of the natural enemies of the Colorado potato beetle. No previous detailed description of the eggs of this species has been found, so the description prepared by the writer is given.

Description of egg: Length, 1.7 mm.; greatest width, 1 mm.; least width, just below extension of chorion, .4 mm.; length of extension of chorion, .2 mm. Color, brown; extension of chorion at top of egg, whitish. Somewhat kidney-shaped, wider at base, one side convex, broadly rounded, the other almost straight, very slightly concave; narrowed in region of cap. Extension of chorion at top, membranous, reticulated, whitish, tubelike; cap with central rodlike structure, this extended above tubelike extension of chorion; base of rod provided with reticulated, flaring membrane.

The eggs of this species are laid singly, resting on the broad curve at the lower end of the egg, and attached to their support by a small amount of cement. In the laboratory they were attached to the cheesecloth and wire screen of the cage.

Pselliopus barberi Davis.

I have recently obtained examples of the eggs of this species through the courtesy of Mr. McAtee, of the United States National Museum. A comparison of this egg with that of *Pselliopus cinctus* shows that it is practically identical as far as the more general features of shape and size are concerned. The material is not of such a nature that detailed measurement of parts and critical comparisons of the detailed structures of the cap can be made. It is quite likely that such measurements and comparisons would show distinct differences, however, since these are distinct, though closely related, species.

The eggs of the two last mentioned genera are similar. They have the same general shape and appearance, and each possesses an erect, whitish, reticulated extension of the chorion at the top of the egg. They differ in that the eggs of *Pselliopus* are laid singly, while those of *Zelus* are laid in a mass; and in that the top of the extension of the chorion is turned in to almost cover the cap in *Zelus*, and is not turned in *Pselliopus*. It is quite certain that the eggs of these two genera resemble each other more closely than they do the eggs of any other genus of this, or other subfamilies studied.

Arilus cristatus (Linnæus).

(Pl. XI, figs. 1 and 2.)

This is the insect known as the "Wheel bug," one of the largest and best known of our common reduviids. It is commonly found on weeds, shrubbery, and the lower branches of trees. The egg mass of this insect, judging from the number of references to it, must be known to more people than that of any other reduviid. The reasons for this are that it is a rather common species, that the egg mass is large and conspicuous, and that the entire winter is spent in the egg stage, instead of two or three weeks of the summer as is the case with most reduviids.

Heidemann[5] gives the following descriptive notes concerning the eggs of this species: "The eggs are oval-elongate; dark-brown; chorial processes inside the extended rim, club-shaped."

Howard[7] describes the eggs as follows: "The eggs of the wheel bug look like miniature leather bottles standing on end and in hexagonal clusters, seventy or more in a group, and attached to the bark of trees, on fence rails, or wherever the female happens to be."

Description of egg: Total length, 3 mm.; length to extension of chorion, 2.6 mm.; width, 1.3 mm.; diameter of extension of chorion,

from a little less than greatest width to a little more. Color, brown, darker toward upper end; extension of chorion, whitish; central area of cap, dark brown; appendages of rim of cap, buff. Shape, subcylindrical, rounded at lower end, somewhat narrower at upper end; membranous, reticulated, somewhat flaring extension of chorion at upper end; central disk of cap very slightly raised, outer rim of cap with two sets of filamentous appendages, one turned outward over extension of chorion, the other turned inward over central area of cap.

While the eggs of this species do not resemble those of any other species of the subfamily very closely, yet it must be admitted that they are more like the eggs of *Acholla* and *Sinea* than like those of *Pselliopus* and *Zelus*.

Acholla multispinosa (De Geer).

(Pl. XI, figs. 3 and 4.)

The genus *Acholla* is very closely related to the genus *Sinea*. This relationship is shown not only by the similarity of the adult insects, but also by the similarity of the eggs. This species is a rather common one, being found often on the leaves and branches of trees. While no previous description of the eggs of this insect has been found, there is, nevertheless, an excellent photograph of the egg mass, taken by Mr. Walden,[16] in the "Hemiptera of Connecticut."

Description of egg: Length, 1.7 mm.; width, .7 mm.; diameter of extension of chorion, .9 mm. Color, dark brown, with extension of chorion lighter. Shape, elongate-oval, narrowed at top; extension of chorion at top of egg, horizontal, reticulate, with crenulate margins; cap with an outer, finely and evenly reticulated circular margin; a raised crater, lighter than the rest of the cap; and an inner, darker, flat central disk; crater composed of scales, dark at bases, lighter at apices.

The eggs of this species are laid in compact masses cemented to the twigs of trees. The masses at hand show a count of from thirty-three to forty eggs in each mass.

Sinea diadema (Fabricius).

(Pl. XI, figs. 5 and 6.)

This is one of our most common reduviids, present in almost any open, sunny field, and of possible importance as a beneficial predacious insect. It is a rather small, greyish or brownish, spiny insect, referred to by Ashmead[1] as the "Crowned Soldier Bug." The eggs have been described and figured previously.

The following description of the egg is taken from an article by G. W. Barber[2]:

"Length, 1.3 mm.; width, .6 mm.; diameter of extension of chorion, .8 mm. Color, brown, minutely granulated, somewhat shining; central area of cap, brown; outer rim, brown with minute, regular, white reticulations; extension of the chorion, white with dark lines, brown towards the inner edge; shape, subelliptical, narrowed towards the cap; central area of cap raised, conelike, bluntly rounded at the tip, composed of several scales which fail to meet at the tip; outer rim of the cap flat, with minute, regular reticulations; extension of the chorion on the same plane with the outer rim of the cap in new laid eggs, after hatching or drying bending upwards or downwards, squamous, minutely so towards the inner border, gradually coarser outwards, edge sinuate; chorial process numerous, elongate, club-shaped, within the extension of the chorion."

The eggs of this species were easily obtained by confinement of adults. A number of adults were placed in a rather large cage, and mating pairs were removed from this cage from time to time as observed, and isolated in smaller cages. The eggs were laid freely on the sides of the containers, or on bits of stick and leaves. They are laid in double rows, in groups of from five to twenty-two, the usual number being from eight to twelve. They are attached by means of a cement.

Sinea spinipes (Herrich-Schäffer).

(Pl. XI, figs. 7 and 8.)

This species is very similar in general appearance to the preceding, though it is found in a different habitat. It is taken on the branches and leaves of forest trees most commonly, and appears to be a shade lover. It is not nearly as common a species as the preceding. No previous description of the eggs has been found.

Description of eggs: In size, shape and general appearance very similar to those of *Sinea diadema* (Fabricius). Length, 1.5 mm.; width, .7 mm.; diameter of extension of chorion, .9 mm. Color, brown; extension of chorion, buff, darker near rim of cap; central area of cap, brown, with central spine darker; membrane around rim of cap, darker. Shape elongate-oval, slightly narrowed towards cap; extension of chorion at top of egg nearly horizontal, reticulated; margin, irregular, much incised. Central area of cap occupied by disk, erect spine in center; a dark membrane around rim of cap, membrane divided into many very delicate, filamentous, erect appendages.

The eggs of this species were obtained only in the laboratory, and could be secured easily by confinement of adults. The eggs are laid

in a rather irregular, double row, being attached to their support by a very small amount of cement. There may be from three to fourteen eggs in one of these groups.

The eggs of the last three species considered are very similar. They resemble each other in size, shape, and general appearance. Those of *Acholla multispinosa* (De Geer) differ from those of either species of *Sinea* in that they are laid in a compact mass, rather than in a double row. The eggs of *Sinea diadema* (Fabricius) differ from those of *Sinea spinipes* (Herrich-Schäffer) in that the extension of the chorion is lighter in color and not so deeply incised in *Sinea diadema* (Fabricius), and in that the scales of the cap are more numerous and conspicuous, and inclined toward the center of the egg in *Sinea diadema* (Fabricius), while they are fewer in number, more delicate and inconspicuous, and stand nearly erect in *Sinea spinipes* (Herrich-Schäffer).

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PLATE IX.

FIG. 1. Egg of *Reduvius personatus* (Linnæus).
FIG. 2. Egg of *Triatoma sanguisuga* (Le Conte), (after Miss Kimball).
FIG. 3. Egg of *Melanolestes picipes* (Herrich-Schäffer), viewed from side.
FIG. 4. Same, viewed from above, twice scale of 3.
FIG. 5. Egg of *Rasahus biguttatus* (Say), viewed from side.
FIG. 6. Same, viewed from above, twice scale of 5.

PLATE IX.

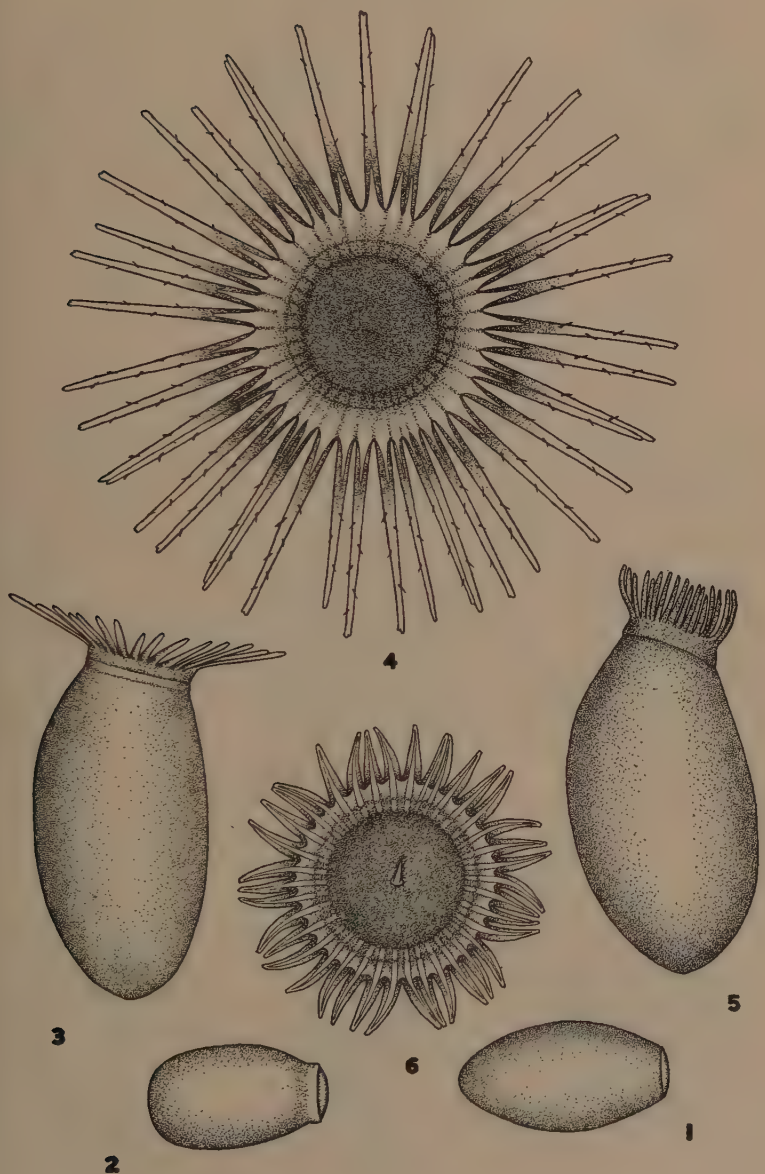

PLATE X.

FIG. 1. Egg of *Pselliopus cinctus* (Fabricius), viewed from side.
FIG. 2. Same, viewed from above, twice scale of 1.
FIG. 3. Same, cap removed in hatching, twice scale of 1.
FIG. 4. Egg of *Oncocephalus apiculatus* Reuter, viewed from side.
FIG. 5. Egg of *Zelus exsanguis* (Stal), viewed from side.
FIG. 6. Same, viewed from above, twice scale of 5.
FIG. 7. Same, cap removed in hatching, twice scale of 5.
FIG. 8. Egg of *Zelus socius* (Uhler), viewed from side.
FIG. 9. Egg of *Apiomerus spissipes* (Say), viewed from side.
FIG. 10. Egg of *Emesaya brevipennis* (Say), viewed from side.
FIG. 11. Egg of *Metapterus fraternus* (Say), viewed from side.
FIG. 12. Egg of *Apiomerus spissipes* (Say), viewed from above, twice scale of 9.

PLATE X.

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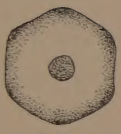

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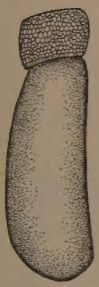

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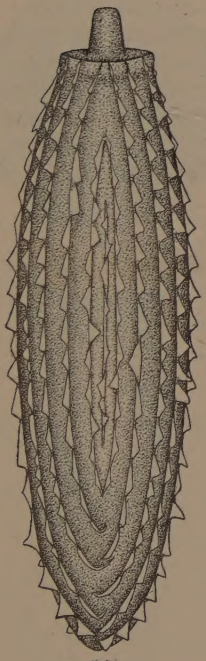

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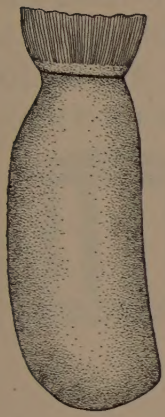
PLATE XI.

FIG. 1. Egg of *Arilus cristatus* (Linnæus), viewed from side.
FIG. 2. Same, viewed from above, twice scale of 1.
FIG. 3. Egg of *Acholla multispinosa* (De Geer), viewed from side.
FIG. 4. Same, viewed from above, twice scale of 3.
FIG. 5. Egg of *Sinea diadema* (Fabricius), viewed from side.
FIG. 6. Same, viewed from above, twice scale of 5.
FIG. 7. Egg of *Sinea spinipes* (Herrich-Schäffer), viewed from side.
FIG. 8. Same, viewed from above, twice scale of 7.

PLATE XI.



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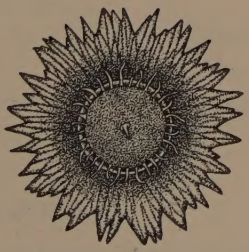

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